

IS 'MORE' ENOUGH?

**Reassessing the impact of growth on
inequality and poverty**

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Why more money does not necessarily mean less poverty

The relationship between economic growth and human development is complex, and even the relatively simple links between economic growth and people not having sufficient money for basic essentials such as food and medicines (known as income poverty) are not well understood. Increasingly urgent environmental considerations militate against the pursuit of unconstrained growth, while at the same time making more pressing the need to ensure that growth delivers reductions in income poverty.

The impact on poverty partly hinges on whether or not economic growth is likely to reduce or exacerbate income inequality, making it a more or a less powerful instrument against poverty. It has been suggested that if growth generally reduces or does not affect inequality, then policymakers can simply pursue growth as a development strategy – in other words, pursuing ‘more’ could be enough.

Advances in econometric technique have brought new results and new interpretations for policymakers, but this critical review suggests that there are no clear results that can be relied upon. Instead, our own analysis leads us to conclude that there is much variation in the relationship between income and inequality – inequality may either fall or rise as a result of growth. Moreover, we find that other aspects of development, such as health and education, may be more important than levels of income in determining the effect of growth on inequality and should therefore be given more attention by policymakers.

At a minimum, these findings imply that policy recommendations concerning growth need to be based on careful analysis of country-specific development indicators. Seeking to maximise growth is unlikely to be appropriate development policy unless fairly specific conditions and policies are in place – and there is much more to understand about how these factors will change the impact of growth on inequality. Future research should aim to identify the preconditions and complementary policies necessary for growth to be of more benefit in reducing income poverty.

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INTRODUCTION: ASSESSING THE RELATIONSHIP BETWEEN GROWTH AND INEQUALITY

Economic growth can be a powerful tool for development and poverty eradication. Higher national income levels can be associated with a reduction in the number of people living in income poverty, if income inequality has not risen. Moreover, the direct and indirect impacts of higher national income levels can also feed through into higher government revenues and social spending, and hence to stronger outcomes in important development areas such as health and education. Hence growth may have a role in reducing the lack of personal, social, political and broader economic power that contribute to the complex phenomenon of poverty.¹

If the relationships between growth and poverty were known, and were completely predictable and consistent, then it would be possible to determine for any given country what level of growth to target, and how to do this, in order to maximise not the level of growth or income itself but rather the impact on poverty. Given considerable uncertainty over even the income poverty and growth relationship, however, there is a need for better understanding, on the one hand,

and greater caution in giving policy advice, on the other. Simply pursuing 'more' is unlikely to be enough.

In addition, growing awareness of the environmental limits to particular economic approaches underscores the need to use growth more efficiently. If growth is necessarily constrained in this way, research that addresses the impact of growth on poverty becomes critical.

This paper addresses one important area of the impact of growth. If there are systematic differences in the way that growth translates into changes in income poverty due to the effect of growth on inequality, then the instrumental value of growth will differ in different country contexts. Creating and exploiting further knowledge about this linkage would allow policymakers to improve poverty impact.

The link between income inequality and economic growth has been studied consistently over the past 50 years. Perhaps the majority of the literature has focused on the effect of inequality on growth.² However, there has also been substantial attention to the relationship in the opposite direction – that is, how

growth affects inequality. This work has often been framed around that of Simon Kuznets (1955), whose theory predicted that inequality would increase within countries as they industrialised, but then begin to decrease once industrialisation was achieved. This gave rise to what has come to be known as the Kuznets curve, an inverted U-shaped curve that would therefore occur when inequality is plotted against income.³ Taken to its extreme, the Kuznets inverted U-shaped curve hypothesis tells us that 'more' could be enough – that eventually, greater growth will necessarily reduce inequality and hence poverty.

A large number of studies demonstrate evidence for an inverted U-shaped curve in the cross-country data. In other words, at a given moment in time, middle-income countries tend to exhibit higher inequality than either low- or high-income countries. However, using cross-country evidence to explore a dynamic process may be inappropriate, and those articles that have focused on changes within countries have found significantly less support for an inverted U-shaped curve.

Overall we find in the literature evidence of great variation in the way inequality changes within countries as they grow. This emphasises the need for further study because it suggests that there are both 'good' and 'bad' ways to grow, rather than an inevitable path. We explore whether other aspects of development, such as health and education, can set countries on a 'good' path. We identify several interaction terms that have a greater explanatory power than the 'income squared' term often included in empirical studies, suggesting that there are potentially powerful tools open to policymakers to increase the poverty reduction impact of growth.

This is where further research should focus.

1. LITERATURE REVIEW

a. Overview: what relationship between growth and inequality?

Although Kuznets' (1955) hypothesis of an inverted U-shaped curve (with inequality increasing as countries industrialised but then decreasing once industrialisation was achieved) related to a within-country relationship across time, much empirical work has focused on explaining differences in inequality between countries. This focus was partly driven by a lack of historical data on inequality. Ahluwalia (1976a, 1976b) provided early cross-sectional empirical work that found evidence supporting the Kuznets hypothesis at a time when little in the way of panel data existed. More recent work that compares inequality across countries has also found evidence supporting the existence of a Kuznets-like inverse U-shaped relationship. This work includes that of Campano and Salvatore (1988), Tsakloglou (1988), Jha (1996), Dawson (1997), Eusufzai (1997), Barro (2000), Thornton (2001), Gregorio and Lee (2002), Huang (2004), Iradian (2005), and Fielding and Torres (2006). Some of these studies use more recent panel data, and hence also include variance within countries over time. However, since the data is pooled in their regressions, their results are likely to be driven by cross-sectional differences, because the variation in inequality is much greater between countries than within.

Overall, the cross-sectional evidence appears to suggest an inverse-U relationship. However, several authors have questioned relying on such evidence, since they point out that there are likely to be unobservable variables that are correlated with both income and inequality. They argue that using a fixed-effects approach may solve this problem, since these variables may well be relatively constant over time within countries. Deininger and Squire (1996) collected a reasonably large panel of relatively high-quality data. Using this dataset, Deininger and Squire (1998) test the robustness of the Kuznets result and find it questionable. Looking at the relationship between income and inequality within countries, they find that there are fewer countries with an inverse-U relationship than with the opposite.

Beck, Demirguc-Kunt and Levine (2007) use the existence of a panel dataset to study the factors affecting changes in inequality, which also removes problems of non-varying country-level unobservables that affect initial levels of inequality. Although the primary focus is on the effect of finance on inequality, they also include income terms in the regression and find no support for the Kuznets hypothesis. Ravallion and Chen (1997) and Ravallion (2001) also look at first-differences in inequality and income and find no correlation.

Bruno, Ravallion and Squire (1998) use the Deininger and Squire (1996) dataset to run a cross-country regression

on the more recent data. They find no significant Kuznets curve in the 1990s, and therefore suggest that the results of previous studies are driven by earlier historical data, which may be more prone to measurement error. They also find evidence that past inequality influences current incomes, and hence argue that if past inequality is an important predictor of current inequality, the standard cross-country regressions used to test the inverted U will be biased. Lopez (2006) also finds that the relationship between income and inequality changes over time. Using a first-differenced approach, he finds that overall there is no encompassing relationship when regressing inequality on growth. However, he also finds evidence that this relationship has changed by the 1990s, and that in this period growth was associated with significant increases in inequality.

The lack of strong evidence for any consistent relationship within countries is probably what leads Lopez (2004) to conclude 'all in all the previous discussion suggests that there is some consensus on the lack of causality from growth to income distribution in one or the other direction'. However, there is much difficulty in drawing any strong conclusions from the existing literature, even that which considers only within-country changes in inequality and income. This is because there are three fundamental problems that arise when carrying out cross-country empirical work on inequality and income: poor data, uncertainty over functional form and econometric estimation.

b. Data quality

While the data collected by Deininger and Squire (1996) is certainly a significant improvement on what went before, it still suffers many failings. Due to the nature of statistical collection, the sample is biased towards developed countries, and this is particularly the case when we are looking for countries with several observations. Furthermore, the ability to compare between countries is weakened by the fact that income inequality is collected in different ways. Income is sometimes measured net of taxes, other times gross, and sometimes the measures are based on consumption rather than income. Although the studies using this data try to correct for this by adding dummies or adjusting inequality appropriately, Knowles (2005) argues that such techniques are limited and fundamentally the data is not comparable.

This problem also occurs even when looking at trends in inequality within countries. Atkinson and Brandolini (2001) study the observations for Organisation for Economic Co-operation and Development (OECD) countries within the Deininger and Squire (1996) dataset and find problems. For example, France shows a sharp drop in inequality between 1975 and 1980, but Atkinson and Brandolini (2001) show

that this is entirely due to a change in methodology, and hence any inference would be misleading. Even when methodologies are the same, the fact that these are single observations (rather than averages) means serious measurement error is likely to be present, particularly for developing countries. Banerjee and Duflo (2003) find several countries within the Deininger and Squire (1996) data that show a large increase in one five-year period seem to also have a large decrease in the following or previous five-year period, which seems most likely to be due to measurement error. As well as causing the standard econometric biases associated with measurement error, Banerjee and Duflo (2003) argue that it is likely to be particularly damaging for studies relating income to inequality. This is because measurement errors are more likely to occur in periods of crisis, which in turn are associated with low or negative economic growth.

A few studies have tried to solve these problems by using an alternative source of data. Bowman (1997) selects eight countries that would have passed the supposed 'Kuznets turning point' between 1950 and 1980, and focuses on finding reliable longitudinal data for these countries specifically. With this more reliable data, he finds that there is no general pattern that the countries have followed over the period. Taking a different approach, Galbraith and Kum (2003) use data constructed by the University of Texas Inequality Project that measures inequality in manufacturing wages. Looking at industrialised countries, they find that inequality does appear to fall as income increases, as predicted by Kuznets. However, they also find some evidence that past a certain income level, inequality instead appears to increase. Overall however, there is little potential to find improved historic data on total inequality, particularly for developing countries.

c. Functional form

A second key problem with studying the effect of income on inequality is uncertainty over the appropriate functional form to estimate. Among the studies mentioned above, income is entered into the regression in a wide variety of ways. Some estimate a quadratic function of GDP per capita, others a quadratic in the log of GDP per capita, and others a linear and an inverse term (ie $1/(\text{GDP per capita})$).

Anand and Kanbur (1993b) show that the functional form appropriate for testing the Kuznets hypothesis is dependent on the measure of inequality used. For the Gini index, which is used in most studies, they show that inequality should be regressed on GDP per capita and its inverse. Carrying out cross-country regressions using a variety of functional forms, Anand and Kanbur (1993a) show that the existence of the Kuznets curve is not robust to changes in functional

form. Indeed, using their preferred terms, they find evidence for a U-shaped curve, ie the opposite result. Banerjee and Duflo (2003) show that this has similarly been a problem in the literature looking at the effect of inequality on growth, and explain how this may lead to different studies coming to apparently contradictory results.

Several papers have tried to get round this problem by using non-parametric methods. Eusufzai (1997), for example, tests the Kuznets hypothesis by simply searching for a break in the relationship between income and inequality. He finds support in the cross-sectional data for the Kuznets hypothesis by finding a point where beforehand income increases with inequality and after which the opposite is the case. Huang (2004) uses a non-parametric method to estimate the shape of the relationship between income and inequality, again focusing on cross-sectional differences. He finds evidence that a Kuznets-type curve exists and that a quadratic approximation is appropriate. However, this conclusion is not reached by Frazer (2006), who also uses a non-parametric analysis. Using the pooled cross-country data, he finds a relationship that is closer to cubic than quadratic and argues that this explains why different results are obtained, depending on whether the quadratic estimated is in GDP per capita or the log of GDP per capita. Furthermore, looking at the within-country data, he finds considerable heterogeneity, with no consistent pattern. He concludes that there are evidently a lot of different ways to grow in terms of changes in inequality.

All the above studies have looked at the relationship between levels of income and levels of inequality, or changes in both. An alternative approach has been to study how levels of inequality are affected by changes in income (ie growth). Chambers (2007) uses a semi-parametric technique to focus on the effect of growth on inequality. After regressing inequality on income (and finding evidence for a Kuznets effect), he then adds in a function of growth. The study suggests that growth in the short to medium run increases inequality. However, in the long run, the relationship between growth and inequality is U-shaped. Hence, if two nations are otherwise identical, the nation experiencing growth that is, in absolute magnitude, furthest away from its average long-run growth rate will also possess the lowest income inequality. This is in sharp contrast to the results of Breen and García-Peñalosa (2005) who find that output volatility causes increases in inequality. Indeed, when they control for the volatility of income, their estimated coefficients on the other income terms, including growth, become insignificant.

Chang and Ram (2000) separate countries into those that have experienced low growth and those that have experience high growth, and find the latter have significantly

less inequality. Lundberg and Squire (2003), on the other hand, take a difference approach in estimating equations for growth and inequality simultaneously, arguing that the two variables are likely to be affected by the same variables. For instance, they find that trade openness causes faster growth but increased inequality. They also find that growth has a statistically strong and adverse effect on inequality. Overall therefore, including growth in the equation appears to lead to no clearer results than those studies focusing on income.

d. Estimation

A final problem with exploring the effect of income on inequality is the difficulty of estimating such an equation econometrically. As we have already discussed, omitted variable bias may be part of this problem. While using country-fixed effects may remove some such bias, there are also likely to be variables correlated with both income and inequality that change over time.

It may be possible to include some of these variables in the analysis. For example, Higgins and Williamson (1999) look simultaneously at the effect of income, cohort size and openness using Deininger and Squire's (1996) data. They find evidence of a Kuznets curve, even with fixed effects, and argue that Deininger and Squire's (1998) failure to find the same result is caused by not controlling for these other factors. Similarly, Barro (2000) finds evidence of a Kuznets curve when fixed effects and many other controls are included. However, both these studies conclude that, particularly in the within-country estimates, the importance of the income terms is small relative to some of the other factors that influence inequality.

A second problem with estimating the equation using panel data is that inequality is fairly persistent, as shown by Li, Squire and Zou (1998). Hence a number of studies find significant serial correlation in the residuals (this includes Higgins and Williamson (1999), Galbraith and Kum (2003), Fielding and Torres (2006)). While the resulting bias to standard errors is correctable, there is a greater danger of serially dependent explanatory variables. In particular, if income is correlated with past inequality, then this will bias the coefficient on income. In an attempt to control for this, Higgins and Williamson (1999) include lagged inequality in their regressions. However, as they admit, including such a term may also cause bias in the other coefficients, even when fixed effects are included. This problem is reduced when T (the number of time periods) is large, or can be removed using 'generalised method of moments' (GMM) estimation. However, to solve the problem in this way would require several observations within each country, which, given the poor data quality, would mean rejecting many developing countries from the sample.

A final econometric problem is the potential for reverse causality. There is much theoretical work suggesting that inequality will affect income growth, and indeed empirical evidence has frequently found evidence for some kind of link. As a result, a correlation between inequality and income might not suggest any effect of income on inequality, but rather the other way round. Since it is not certain how inequality affects income, it is not even clear which way this reverse causality would bias coefficients.

There are, of course, econometric tools that may potentially tease out the direction of causality. Lundberg and Squire (2003), for example, run simultaneous regressions for income and inequality, arguing that they evolve simultaneously, and instrument using three-stage-least-squares (3SLS). Similarly, Fielding and Torres (2006) use 3SLS to estimate four simultaneous equations (for income, education, health and inequality). An alternative approach is that of Dollar and Kraay (2002) who use system GMM to instrument for income.⁴

However, there are two problems that limit such an instrumental or simultaneous equation approach. First, there are few variables that can be assumed to be correlated with income but not inequality, limiting the use of other exogenous variables as instruments. Second, the problems with functional form discussed earlier cause difficulties. For instance, if we wish to instrument for income, we require a variable that is correlated with income but not directly correlated with inequality. However, variables correlated with income may also be correlated with growth or other functions of income, and hence if these variables are not controlled for, the coefficient on income will be biased. This is a possible weakness of the Dollar and Kraay (2002) approach, which essentially instruments income levels with lags of growth, and relies on the fact that lags of growth aren't correlated with the same country unobservable(s) that are correlated with inequality. While the tests they carry out support this hypothesis, the premise nonetheless seems unlikely. In sum, ruling out reverse causality is likely to be difficult.

e. Conclusion

The majority of papers looking at cross-sectional differences in inequality do appear to find support for a Kuznets curve. However, this result is not robust. In particular, there appears to be much less evidence that such a relationship holds over time within countries. In this case, where fixed effects or first-differences are used, there appears to be no robust link between income and inequality. Such analysis also faces difficulties resulting from data quality, functional form choice and econometric estimation. These problems suggest that we should be cautious when drawing conclusions from

cross-country empirical work studying the link between income and inequality, and emphasise the continuing need for country case-studies and more data collection.

The lack of clear results in the literature reviewed should not lead us to believe that there is no link between income growth and changes in inequality. As pointed out by Ravallion (2001), it is important to look beyond the averages. There is substantial heterogeneity in the way inequality changes within countries when they experience growth. This heterogeneity in fact emphasises the need to study further the relationship between inequality and income, because it suggests that there are both 'good' and 'bad' ways to grow, rather than an inevitable path. The next step is therefore to go beyond searching for a simple relationship between income and inequality and attempt to understand what influences the way income affects growth.

2. DATA AND METHODOLOGY

The inequality measure we use is the natural log of the Gini coefficient. Our inequality data comes from the UNU-WIDER World Income Inequality Database, Version 2.0c (May 2008). This is an update of the dataset originally compiled by Deininger and Squire (1996), containing Gini coefficients across a range of countries in the period 1960-2007. This dataset is a compilation of mainly country-level survey results, and hence inequality measures vary in the income concept and their survey type. We use only observations that have a quality rating of one or two, dropping those where the income concept and the survey type are problematic or unknown.

To adjust for the fact that different income concepts were used, we carry out the same adjustment process used by Dollar and Kraay (2002), among others. This involves regressing the Gini coefficients on dummies for each income concept (ie gross, net and consumption) and adjusting the Gini values appropriately. Like Dollar and Kraay (2002), we include regional dummies when doing this in order to control for the fact that different income concepts may be used more frequently in different regions. This gives us a resulting Gini coefficient that is more comparable across observations.

The measure of income levels we use is the log of GDP per capita. This is the chained index version as measured in the Penn World Tables version 6.2, constructed by Heston, Summers and Aten (2006).

Our other variables are then taken from a range of data sources. Our measure of democracy is from the Polity IV project database constructed by Marshall and Jaggers (2002). The number of physicians per 1,000 people, female life expectancy, percentage of the labour force that is female and government expenditure as a share of GDP are taken from the World Development Indicators constructed by the World Bank. For political polarisation, we use the measure constructed by Keefer and Stasavage (2003) found in the database of political institutions compiled by Beck, Clarke, Groff, Keefer and Walsh (2001). This estimates the maximum difference between the executive party and the four principle parties of the legislature. We use three different measures of education from three different sources. Our measure of educational inequality is the log of the Gini coefficient constructed by Thomas, Wang and Fan (2001). We also use the percentage of the population without any formal education constructed by Barro and Lee (2001) and the average years of education among the population estimated by Lutz, Goujon, Samir and Sanderson (2007). Financial development is the ratio of deposits to central bank holdings as measured as by Beck, Demircuc-Kunt and Levine (2000). The Human Development Index is published by the United Nations Development Programme. Summary statistics for all of these variables are presented in Table 1.

Table 1: Summary statistics

Variable	Observations	Mean	Median	Minimum	Maximum
Gini coefficient	554	37	36	17	76
GDP per capita (US\$)	554	8680	6349	430	44592
Education Gini	340	0.42	0.39	0.1	0.93
Democracy index	404	6	8	0	10
Political polarisation index	390	0.52	0	0	2
Female labour (%)	383	40	42	18	54
Deposits/Central bank assets	448	0.8	0.86	0.052	1
Government expenditure/GDP (%)	447	16	15	1.4	39
Average years of education	404	6.9	7	0.24	13
Uneducated population (%)	393	26	18	0	99
Number of physicians (per 1,000 people)	418	1.5	1.2	0.007	5.6
Female life expectancy	479	69	73	35	83
Human Development Index	386	0.72	0.76	0.27	0.96

A key problem with the data on inequality is that observations are irregular and frequencies vary greatly between countries. In order to limit bias that could result from countries that have a high frequency of observations, we employ the same methodology as Dollar and Kraay (2002) in selecting our observations. For each country, we take the first observation since 1960, and then move forward in time subject to the constraint that at least five years separate observations. In this way, we build an unbalanced and irregularly spaced panel of 554 observations across 136 countries. All other variables used in the regressions are then the average of the values of the raw variable over the five years prior to and including the year for which inequality is observed.

As outlined in section 1, choosing an appropriate methodology for exploring the effect of income levels on income inequality is extremely difficult. Since our aim here is not to find a definitive link between income levels and inequality, we do not attempt to use a methodology that is robust to all the concerns outlined above. Indeed, as we described in our critique, removing all of the problems described is likely to be impossible. We therefore choose to employ a very simple methodology that is the basis of most of the empirical studies described above. This has the advantage of allowing us to compare more directly our results with the existing literature.

Our baseline equation is as follows:

$$(1) \ g_{it} = \alpha + \beta_1 Y_{it}^2 + \gamma_d + \dot{o}_{it}$$

where g_{it} is the log of the Gini coefficient and Y_{it} is the log of GDP per capita of country i at time t . α is a constant, \dot{o}_{it} is the random error term and γ_d represents a set of dummies for each decade. We use decade dummies to control for cross-country changes in inequality. It is not possible to use annual dummies since the irregularity of observations mean that for a given year there may be very few observations across countries.

We then add to this equation various other variables that we may believe influence the way income levels impact on income inequality, such that the equation becomes:

$$(2) \ g_{it} = \alpha + \beta_1 Y_{it} + \beta_2 Y_{it}^2 + \beta_3 x_{it} + \beta_4 x_{it} Y_{it} + \gamma_d + \dot{o}_{it}$$

where x_{it} is the value of the variable of country i at time t . We estimate this equation using pooled ordinary least squares (OLS) regression.

As described in section 1, results from such regressions have been shown to differ significantly depending on whether country fixed effects are included. In order to test the robustness of some of the stronger results, we therefore

also estimate a new equation with country-level fixed effects, ie

$$(3) \ g_{it} = \alpha + \beta_1 Y_{it} + \beta_3 x_{it} + \beta_4 x_{it} Y_{it} + \gamma_d + \bar{\delta}_i + \dot{o}_{it}$$

where $\bar{\delta}_i$ is a time-invariant fixed effect for country i . Note that we have removed from this regression the Y_{it}^2 term, since the within country variation in inequality is generally not strong enough to separate the effects of this term, and the $x_{it} Y_{it}$, given their strong correlation.

As a further robustness check, we also divide the sample into two, based on each of the variables of interest. For example, in the case of the number of physicians, we calculate the median across our sample, and then divide observations into a group where the number of physicians is below the median and a group where it is above. For both groups we then estimate the following simple equation:

$$(4) \ g_{it} = \alpha + \beta_1 Y_{it} + \gamma_d + \bar{\delta}_i + \dot{o}_{it}$$

This tells us, crudely, whether there appears to be any difference in the way that growth affects inequality in the two different groups.

3. RESULTS

Column 1 of Table 2 presents the results of the baseline regression (equation 1 above) where the only independent variables included are income and its square. Here we can see that both terms are strongly significant, and suggest a Kuznets-type curve. The parameters suggest that income growth increases inequality until a country reaches a GDP level of US\$1,025 per head.

The remaining columns of Table 2 present the results of pooled OLS regressions of equation 2, where additional variables and their interaction term with income are added in turn. These demonstrate that the Kuznets-type curve is not robust: rather than the relationship between income and inequality changing at different income levels in the way that Kuznets hypothesised, it appears that income may have been proxying for other variables – so that regressions including these outperform the regression based on equation 1.

We can group the additional variables according to the results obtained:

(i) One group of variables does not enter significantly (democracy and the proportion of people without education – columns 3 and 10).

(ii) Another group of variables and their interaction term with income enter significantly while income and its square also remain significant (educational inequality, financial development and government expenditure – columns 2, 7 and 8).

(iii) A further group of variables and their interaction term with income enter significantly while income and its square lose significance (initial level of democracy, political polarisation, female participation in the workforce, number of physicians per 1,000 people and the Human Development Index – columns 4, 5, 6, 11 and 13).

(iv) For a final group of variables, only the interaction term with income enters significantly, with the income and its square term becoming less significant (average years of education, female life expectancy and lagged inequality – columns 9, 12 and 14).

Groups (iii) and (iv) in particular undermine the robustness of the Kuznets curve result by suggesting that other factors are more likely to be responsible for the apparent finding.

Some of the individual results are of particular interest, and here we focus on the interaction terms with income since these may indicate what variables are associated with growth being more equal, and therefore contributing more to the goal of poverty eradication. The following stand out: initial democracy (ie growth in established democracies may be more equally shared), higher government expenditure (ie

growth accompanied by higher state spending may be more equally shared), female labour participation (ie growth with more gender balance in the workforce may be more equally shared), and education (ie growth with higher average years of education may be more equally shared). In addition, higher initial inequality is associated with growth that exacerbates inequality, which may suggest support in such cases for policies that initially tackle inequality before pursuing growth.

Taken together, these regressions suggest that a number of factors are likely to be important in determining the impact of income on growth besides the level of income itself. However, interpreting the impact of these factors and income on inequality is difficult in this context since there are three income terms and we are measuring differences across both time and countries. In order to analyse further how these factors may interact with income, Table 3 displays the results of a fixed effects regression where the income-squared term is removed (equation 3). We choose a selection of factors that Table 2 suggests are more significant in determining inequality than income squared.

Looking at Table 3, we can see instantly that the coefficients in general are much less significant than in the previous table. This reflects that the largest variation in these variables, including inequality, is between countries rather than within.

Nonetheless, some terms remain significant. In column 1, where we regress inequality on income and income squared, there is weak evidence for a Kuznets curve, with a higher turning point now of around US\$1,907 per head. More significant are the terms in column 2, where income is interacted with (multiplied by) initial democracy. This suggests that while greater income has reduced inequality (that is, is likely to have been most effective in reducing income poverty) in those countries that were originally more democratic (a score of above 4), it has increased inequality in those countries that were undemocratic in 1960. The terms in column 3, where female labour participation is introduced, are less significant, but nonetheless suggest that countries with low female labour participation (below 33 per cent) suffer increasing inequality as income increases. Finally, column 8 gives further evidence that the initial level of inequality is important in determining the way growth affects inequality. Greater income appears to leave inequality unchanged if a country has a Gini coefficient of around 44, and for those countries less equal than this the effect may be an increase in inequality.

An alternative methodology to using interaction terms is to split our sample and to consider whether income has a different effect on inequality in the two groups (as per equation 4 above). The results of such an analysis are presented in Table 4, where the regressions include country-

level fixed effects. Columns 1 and 2 suggest that income levels do partially explain the different correlations between income and inequality across countries. For observations with above median-income, income is significantly negatively correlated with inequality, but this correlation is insignificant in poorer countries. However, this does not appear to be the best variable when it comes to distinguishing between those countries where income is negatively correlated with inequality and those where it is not.

In particular, the difference is more significant when dividing the sample by the initial level of democracy, female labour

participation and government expenditure. Moreover, the correlation between income and inequality is positive, if insignificant, for countries that have an undemocratic regime in 1960, low education levels, a low number of doctors and a low female life expectancy. These factors each lend weight to the hypothesis that income levels may not be the best determinant of whether growth will impact negatively or positively on inequality; and to the view that it may be possible through further research to come to clearer conclusions about which are the key factors in determining the likely benefits of future growth.

Table 2

Variable	1	2	3	4	5	6	7	8
Income	0.513***	1.388***	0.681***	0.359*	0.128	0.745***	0.870***	0.534***
Income²	-0.037***	-0.095***	-0.048***	-0.024*	-0.014	-0.022	-0.068***	-0.030**
Ln (Educational inequality)		1.404***						
Ln (Educational inequality) * Income		-0.162***						
Democracy			-0.002					
Democracy * Income			0.001					
Democracy in 1960				0.127***				
Democracy in 1960 * Income				-0.015***				
Polarisation					0.469**			
Polarisation * Income					-0.049**			
Female labour						0.085***		
Female labour * Income						-0.012***		
Bank deposits							-1.682***	
Bank deposits * Income							0.215***	
Ln (Government expenditure)								0.449*
Ln (Government expenditure) * Income								-0.055**
N (number of observations)	554	340	404	404	390	383	448	447
Number of groups	136	73	98	98	131	131	129	124
R² between	0.128	0.135	0.255	0.267	0.206	0.312	0.188	0.176
R² within	0.198	0.158	0.125	0.14	0.109	0.302	0.152	0.226

Table 2 (continued)

Variable	9	10	11	12	13	14
Income	0.582**	1.203***	0.366	0.812***	-0.165	-0.117
Income²	-0.032*	-0.075***	-0.023	-0.03	0.001	-0.016*
Education	0.383					
Education * Income	-0.063**					
Uneducated		0.006				
Uneducated * Income		-0.001				
Ln (Physicians)			0.306**			
Ln (Physicians) * Income			-0.053***			
Female life expectancy				0.023		
Female life expectancy * Income				-0.004**		
Ln (Human Development Index (HDI))					1.731*	
Ln (HDI) * Income					-0.257**	
Lagged inequality						-0.248
Lagged inequality * Income						0.095**
N (number of observations)	404	393	418	479	386	418
Number of groups	106	85	112	117	120	116
R² between	0.301	0.362	0.397	0.306	0.277	0.765
R² within	0.166	0.12	0.19	0.139	0.174	0.155

*** indicates a coefficient which is significant at the 1% level, ** at the 5% level and * at the 10% level.

Table 3

Variable	1	2	3	4	5	6	7	8
Income	0.423	0.093**	0.358	0.034	-0.137	0.127	-0.102*	-0.679**
Income ²	-0.028*							
Democracy in 1960		0						
Democracy in 1960 * Income		-0.021***						
Female labour			0.103*					
Female labour * Income			-0.011*					
Government expenditure				0.404*				
Government expenditure * Income				-0.046				
Education					0.051			
Education * Income					0.02			
Female life expectancy						0.025*		
Female life expectancy * Income						-0.003		
HDI							-0.516	
HDI * Income							0.134	
Lagged inequality								-1.367*
Lagged inequality * Income								0.179**
N (number of observations)	554	404	383	447	404	479	386	418
Number of groups	136	98	131	124	106	117	120	116
R² within	0.062	0.063	0.095	0.075	0.085	0.047	0.069	0.124

*** indicates a coefficient which is significant at the 1% level, ** at the 5% level and * at the 10% level.

Table 4

Variable	Income		Initial democracy		Female labour participation		Government expenditure		Education	
	Low	High	Low	High	Low	High	Low	High	Low	High
	1	2	3	4	5	6	7	8	9	10
Income	-0.013	-0.099*	0.054	-0.117**	0.032	-0.185***	-0.04*	-0.122**	0.016	-0.077
N	277	277	223	181	192	191	224	223	202	202
Number of groups	99	63	64	34	76	73	75	79	72	53
R² within	0.029	0.064	0.026	0.097	0.005	0.138	0.02	0.064	0.002	0.08

Table 4 (continued)

Variable	Female life expectancy		HDI		Number of physicians		Inequality	
	Low	High	Low	High	Low	High	Low	High
	11	12	13	14	15	16	17	18
Income	0.025	-0.081	0.054	-0.120*	0.014	-0.045	-0.071	-0.003
N	240	239	193	193	209	209	209	209
Number of groups	88	57	80	49	74	57	64	84
R² within	0.026	0.049	0.086	0.046	0.018	0.055	0.041	0

*** indicates a coefficient which is significant at the 1% level, ** at the 5% level and * at the 10% level.

4. CONCLUSIONS

In our review of the literature, we saw that there are several problems with cross-country empirical work when it comes to examining the effect of growth on inequality. These problems are of a fundamental nature, and as such the amount that could be gained from such studies is inevitably limited. Nonetheless, cross-country data can tell us some things and perhaps the clearest message from the literature is that the relationship between income and inequality is highly heterogeneous across countries. A naive look at the data suggests that income levels themselves explain much of this heterogeneity, supporting the Kuznets hypothesis that countries initially grow less equal until they reach some level of income at which point the process is put into reverse. However, papers that have challenged this evidence with more subtle analysis, such as focusing on changes within countries, have found evidence that this is not so clearly the case.

Our empirical analysis is entirely consistent with this analysis. After finding a clear Kuznets-like curve in our data, we found that this was not robust to more careful examination. In particular, unlike other studies that have focused largely on the econometric issues or the functional form of the income-inequality equation, we have asked the question 'what other factors might be influencing the relationship between income and inequality?'. Our results suggest that variables such as female life expectancy and government expenditure are as likely, if not more so, to cause heterogeneity in the income-inequality relationship as income levels. Indeed, if we would like to divide countries into those that saw inequality rise with income and those that saw the reverse, income levels would not be the best way of splitting our sample.

We believe we can draw two broad conclusions from this analysis. In terms of research, the paper casts doubt on the prospect for us to find much evidence for the effect of growth on inequality in the cross-country data. Even if we were to resolve the econometric, functional form and data issues discussed in our critique of the literature, our results suggest that it would be necessary to control for a large range of other factors that may be influencing this relationship. If we are to proceed with cross-country analyses, then perhaps the next step is to move beyond trying to find the equation linking income growth and inequality and instead examine what other variables may explain best the heterogeneity across countries.

In terms of policy, the paper casts further doubt on the belief that we can simply worry about growth and inequality will look after itself. Overall, the results presented here suggest strongly that we should reject the hypothesis of a Kuznets curve, along with its potentially reassuring suggestion that over time inequality may resolve itself as economic

development occurs. 'More' is not enough – and acting as if it could be will only undermine efforts to fight poverty.

Instead, the evidence points to the likelihood that other factors will determine whether future growth reduces or exacerbates income inequality – and therefore the likely extent of growth's benefits for poverty reduction. This suggests that policymakers can in fact hope to pursue growth that is more beneficial – indeed, many of the variables that appear to influence the relationship between growth and inequality are ones over which policymakers have direct control.

Armed with knowledge of this type, policymakers would be in a much stronger position to pursue poverty eradication, with growth making a full contribution – rather than maximising growth instead of its benefits. Further research in this vein can only increase the chances of getting growth right.⁵

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ENDNOTES

1 See Christian Aid 'Doing Justice to Poverty', Christian Aid Position paper, 2008.

2 See Aghion, Caroli and Garcia-Penalosa (1999) for a summary of the theoretical work on the effect of inequality of growth. Banerjee and Duflo (2003) provide a good critical review of the empirical evidence, together with their own findings.

3 Frazer (2006) provides a list of more recent theoretical work exploring how income growth may affect inequality.

4 Dollar and Kraay (2002) in fact uses the income of the lowest quintile rather than inequality as the dependent variable, but, as they describe in their paper, this is essentially equivalent to regressing inequality on income.

5 Christian Aid's 2008 position paper 'Getting growth right' sets out how efforts to maximise economic growth, as if it were the goal of policy instead of one instrument among many, will almost inevitably lead to sub-optimal poverty reduction outcomes.



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